PTSD: A PREDICTOR OF PAIN SEVERITY

IN FIBROMYALGIA PATIENTS

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ABSTRACT

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Traumatic life events have been frequently observed in chronic pain patients in empirical research. More specifically, fibromyalgia (FM) has been reported to occur more often after a traumatic event. As posttraumatic stress disorder (PTSD) is also preceded by a traumatic event and has been associated with chronic pain and FM, the relationship between three variables (traumatic events, pain severity, and PTSD) is evaluated. This study examined data from 26 participants who reported having experienced at least one traumatic event and having been diagnosed with FM by a physician. The TLEQ, BPI, and PCL-C were used as measures for traumatic events, pain severity, and PTSD symptomatology, respectively. The total number of traumatic events (TNTE), number of traumatic events experienced in childhood (NTEC), and number of exceptionally traumatic events (H/H) were not able to individually predict pain severity in the whole group. However, TNTE predicted PCL-C scores and PCL-C scores predicted pain severity. Also, upon splitting the group into subgroups based on when the most traumatic event (MTE) was experienced, both TNTE and PCL-C scores predicted pain severity in the group that experienced their MTE in adulthood.

CHAPTER I

INTRODUCTION

The relationship between traumatic life events and negative outcomes in both mental and physical health has been well established. Childhood trauma specifically has been associated with symptoms of depression, dissociation, anger, anxiety, pain, and somatization (Heckman & Westefeld, 2006) as well as impaired personality formation (Daud, af Klinteberg, & Rydelius, 2008; Rademaker, Vermetten, Geuze, Muilwijk, & Kleber, 2008). In addition, both physical and sexual child abuse have been found to significantly contribute to the variance of pain reports (Sachs-Ericsson, Kendall-Tackett, & Hernandez, 2007; Walsh, 2007; Fillingim & Edwards, 2005; Kendall-Tackett, Durham, Marshall & Ness, 2003). However, trauma experienced later in life has also been associated with pain. Sexually assaulted women have consistently reported increased health problems including chronic pain (Ciccone, Elliott, Chandler, Nayak & Raphael, 2005; Campbell, 2002; Golding, 1999). Other types of trauma in adulthood including victimizations by family members and betrayals in the workplace have been reported more often by fibromyalgia (FM) patients (Steinberg, 2007). In fact, witnessing violence alone was significantly related to pain reports in those suffering from pain disorders (Sansone, 2006).

Anderberg, Marteins Dottir, Theorell, and Von Knorring, (2000) observed that FM patients reported more negative life events when compared to healthy controls and deduced that these stressful life events may trigger the development of FM. In a sample

of 600 FM patients, 91% reported having experienced at least one traumatic event prior to onset of the condition, and concluded that perceived severity of traumatic events may provide useful information about etiology of FM (Walen, Oliver, Groessl, Cronan, & Rodriguez, 2001). Across the lifespan, the number of lifetime traumas was found to have a cumulative effect on physical health, including chronic pain (Sledjeski, Speisman, & Dierker, 2008). Finally, poor physical health in combination with depression reports (Casey, Greenberg, Nicassio, Harpin, & Hubbard, 2008) and PTSD symptoms alone (Campbell, Greeson, Bybee, & Raja, 2008) have predicted chronic pain.

Statement of the Research Problem. Evidence from the research literature suggests that there is a strong relationship between suffering traumatic experiences and being afflicted by chronic pain, including FM (Roelofs & Spinhoven, 2007; Heckman, & Westefeld, 2006; Sansone, 2006; Goldberg & Goldstein, 2000). While the relationship between trauma and FM has been consistently observed, the mechanism linking the two remains unexplained. Both psychological and physiological mediators are considered.

Significance of the problem to Health Psychology. The relationship between trauma, post traumatic stress disorder (PTSD), and health outcomes, specifically chronic pain in the form of FM, is a classic example of the biopsychosocial model. These relationships demonstrate how a social event (e.g., interpersonal trauma) can have a psychological effect (e.g., the victim becomes depressed, anxious, and/or displays PTSD symptomatology) and consequently the person's physiology (e.g., the stress response, pain and other health outcomes) is affected.

CHAPTER II

REVIEW OF THE LITERATURE

Pain. According to the International Association for the Study of Pain, pain is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Feuerstein, 1989). It is important to note that the definition does not require that pain be associated with a stimulus or tissue damage, as many individuals report experiencing pain when no physical stimulus or damage is found (Feuerstein, 1989). Chronic pain, as opposed to acute pain, is that which has persisted for at least a six-month period and is typically resistant to traditional treatments (Whitehead & Kuhn, 1990).

While nociception is the physiologic response to tissue damage or prior tissue damage, not all nociceptive signals are perceived as pain and not all pain is perceived through nociception. There are two main types of nociceptive pain receptors: low-threshold nociceptors that are connected to fast conducting A-delta pain fibers and high-threshold nociceptors that conduct impulses in slow (unmyelinated) C fibers. These pain fibers synapse with spinal neurons within the dorsal horn of the spinal cord. Neurotransmitters, including substance P and glutamate, modulate the postsynaptic responses to neuronal structures including the thalamus, anterior cingulated cortex, insular cortex, and somatosensory cortex (Meeus & Nijs, 2007).

Fibromyalgia. FM is estimated to affect approximately 2-4% of the population. It is more commonly diagnosed in women than men. The prevalence has also been found to increase with age (Wolfe, Ross, Anderson, Russell, & Hebert, 1995).

Currently, the American College of Rheumatology (ACR) defines FM as a syndrome predominately characterized by widespread muscular pains and symptoms such as fatigue, sleep disturbances, stiffness, cognitive and memory problems, and symptoms of depression and anxiety (ACR, 2010). However, as Inanici and Yunus (2004) explain, the history of FM dates back to the 16th century when descriptions of musculoskeletal pains were included in the European medical literature. Over the centuries the syndrome has undergone a multitude of revisions in name, diagnostic criteria, and understanding of the physiology. French physician Guillaume de Baillou first termed muscular rheumatism in 1592 to describe muscular pain and acute rheumatic fever. During the 18th and 19th centuries distinctions were noted by physicians between articular rheumatism and soft tissue musculoskeletal pain. In 1904, Gowers coined the term fibrositis as the condition was understood as an inflammatory problem confined to the muscles and connective tissue. It was not until 1976 that the contemporary term, fibromyalgia, was first used by Hench. The term fibro is the Latin term for fibrous tissue (fibro) and the Greek terms for muscle (myo) and pain (algia) (NIH, 2010).

The CDC (2010) and the ACR (2010) both recognize there is no definitive cause of FM. However, both entities recognize that genetic predisposition and physical and emotional stressors are possible triggers in the development of the illness (ACR, 2010;

CDC, 2010). These types of triggering events in the onset of FM have also been recognized in the research community (Williams & Clauw, 2009; Staud, 2007).

In addition, during the last two decades central sensitization and sensory augmentation have been identified as major factors in the development of this chronic pain condition (Inanici & Yunus, 2004). Meeus and Nijs (2007) explain that central sensitization is increased sensitivity of the spinal cord to painful stimuli (hyperalgesia) and innocuous stimuli (allodynia). These authors also note that while the exact cause of central sensitization is unknown, temporal summation (results from chronic C-fiber stimulation) and disruption of inhibitory systems of pain pathways are suggested as possible causes.

There are difficulties in diagnosing FM, since its clinical picture can overlap with other illnesses and there are no definitive diagnostic tests (ACR, 2010; CDC, 2010; NIH, 2010). The American College of Rheumatology developed a set of criteria for diagnosing FM which included self-report of chronic widespread musculoskeletal pain with no known cause and having 11 out of 18 tender points in all four quadrants of the body. A site is considered a true tender point if the individual reports pain with 4 kg of pressure. However, the ACR now does not require the existence of the tender points, but claims that these tender points may aid in the diagnosis of the condition (ACR, 2010). The Association of the Medical Scientific Societies in Germany created a list of other criteria, excluding tender points: history of widespread pain (axial and all 4 extremities), sleep disturbances, fatigue, and feeling of swelling or stiffness of the hands, feet or face,

and the exclusion of somatic diseases that could account for the symptoms. These criteria have been shown to have moderate concordance in diagnosis of the condition (Hauser, et al., 2010).

Schweinhardt, Sauro, and Bushnell (2008) have proposed that FM patients demonstrate differences in comparison to healthy individuals with regard to the anatomy, physiology and chemistry of their central nervous system, which the authors suggest may be a consequence of early life stress or prolonged or severe stress affecting the brain's modulatory circuitry of pain. The authors specifically noted decreases in gray matter of the perihippocampal gyrus as this structural difference has also been noted in PTSD and chronic fatigue syndrome. In addition, decreased responses to pain inhibitors, dopamine and opioids, were noted in FM patients. In fact, using positron emission tomography Wood et al. (2007) found that FM patients demonstrated decreased production of dopamine, when compared to healthy controls while undergoing the same pain induction.

Psychological variables and Pain. At the time of diagnosis, about 30% of FM patients have major depression; lifetime prevalence of depression is 74% while lifetime prevalence of anxiety disorders is 60% (Buskila & Cohen, 2007). In a review of 191 studies, Fishbain, Cutler, Rosomoff, and Rosomoff (1997) assessed the role of depression as a consequence or antecedent of chronic pain and found more evidence for depression as a consequence. At the same time these authors highlighted the importance of a predisposition for depression in some chronic pain patients. More recently, using data from the National Comorbidity Survey, Sachs-Ericsson, et al. (2007) found that

depression did not mediate the relationship between childhood abuse and pain reports. A community survey of women measured number of health problems and mental health disorders (depression, anxiety, and substance abuse), and found that none of these mediated the relationship between physical abuse and chronic pain (Walsh, 2007). In addition, Jensen et al. (2010) demonstrated that anxiety, depression, and catastrophizing were not related to clinical or induced pain but were related to poor perception of health in FM patients. However, Ericsson, et al. (2002) found that depression was useful in predicting disability in chronic pain patients.

In a thorough literature review, Roelofs and Spinhoven (2007) found that somatization models (i.e. dissociation and conversion) have limited support for mediation between trauma exposure and medically unexplained symptoms (MUS) such as chronic pain syndromes and irritable bowel. Hypervigiliance, catastrophizing, and somatization have been associated with exacerbating pain in the absence of tissue damage (Meeus & Nijs, 2007).

PTSD. According to the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition Text Revision (2000), the essential feature of Posttraumatic Stress Disorder (PTSD) is exposure to an extreme traumatic stressor involving the threat of or experience of harm (threat to physical integrity, serious injury or death) to one's person or exposure to/learning of that of a family member or close associate. The individual must respond with intense fear, helplessness, or horror. Consequently, the affected individual will experience ongoing experience of the traumatic event, persistent

avoidance of the stimuli associated with the trauma, persistent and increased arousal, these symptoms must last for more than one month, and must cause clinically significant distress or impairment in at least one major arena of functioning.

Approximately 6.8% of people in the United States will develop PTSD at some point in their lives (Yehuda & LeDoux, 2007). Empirical research has revealed that only a fraction of individuals who are exposed to extreme stressors actually develop PTSD, although researchers originally hypothesized that PTSD was a normative response to extremely stressful events (Kessler, Sonnega, Bromet, Hughes & Nelson, 1995). PTSD symptoms are universal in the first few days or weeks after a traumatic event; however, they persist after a month of exposure to the traumatic event in those with PTSD (Adams & Boscarino, 2006). Although a small percent of people (about 5%) that develop PTSD do not have the symptoms immediately (Adams & Boscarino, 2006). Yehuda and LeDoux (2007) suggest that PTSD represents a specific phenotype which fails to recover from the normal effects of trauma.

Risk Factors for developing PTSD. Risk factors for developing PTSD can be divided into two categories: event characteristics such as severity and type the trauma and individual differences such as personality traits and other posttraumatic life events. With regard to event characteristics, there is a greater prevalence of PTSD following exposure to interpersonal violence than exposure to accidents (Yehuda & LeDoux, 2007). Individual differences such as a family history of psychopathology, cognitive factors (including lower IQ), childhood adversity, avoidant personality and behavioral problems,

and poor social support are personality variables that increase risk for developing PTSD (Yehuda, et al., 2006).

Evidence for the heritability of vulnerability for PTSD has been limited. The most compelling findings have been those in twin studies where prevalence among twins was significantly increased despite variability in traumatic exposure (Koenen, et al., 2002; Stein, Jang, Taylor, Vernon, & Livesley, 2002; True, et al., 1993). A few genes have been found to be positively related to PTSD including N363S and the BclI polymorphisms, which are thought to sensitize glucocorticoid receptors; however, these genetic traits have also had empirically insignificant relationships with PTSD (Bachmann, et al., 2005). Since genetics alone have not provided a stable relationship, epigenetic alterations have also been suggested as playing a critical role in developing PTSD. A critical example of such an epigenetic finding was demonstrated by Weaver, et al. (2004), which revealed that increased licking and grooming of rat pups by their mothers resulted in alterations of the glucocorticoid receptors in the hippocampus. Offspring of mothers that licked and groomed less often demonstrated increased hippocampal glucocorticoid receptor expression and enhanced glucocorticoid feedback sensitivity. The authors suggest that this finding exemplifies how HPA axis reactivity can be affected by environmental influences and that through natural selection, organisms are selected that can be adaptive to and prepared for the environment. Yehuda and Bierer (2009) suggested that epigenetic alterations be used in the DSM V for PTSD risk as they

may help explain long-lasting effects of trauma exposure and variation among individual responses.

This finding corresponds with the interpretation of empirical evidence which suggests that early life events correlate with the development of PTSD (Koenen, Moffitt, Poulton, Martin, & Caspi, 2007) and that childhood trauma may sensitize individuals to trauma later in life, contributing to the development of PTSD (Irish et al., 2008; Koopman, et al., 2005; Koopman, Gore-Felton, Classen, Kim, & Spiegel, 2001). Likewise, Van Zeist, de Beurs, Beekman, Deeg and van Dyck (2003) found that neuroticism and adverse events in early childhood were the strongest vulnerability factors for both PTSD and subthreshold PTSD. In addition, Masho and Gasmelseed, (2007) found that women who were sexually assaulted later in life (18 years and older) were less likely to develop PTSD than those assaulted earlier in life.

Yehuda and LeDoux (2007) as well as Kolassa and Elbert (2007) discuss the influence of specific differences in structures of the central nervous system have been found in patients with PTSD including atrophy of the medial prefrontal cortex (mpfC) and the hippocampus, but hypertrophy of the amygdala. However, it is not clear whether these distinct features of brain structures are a cause or consequence of PTSD.

The amygdala, a structure of the limbic system, is involved in emotional processing and acquiring fear responses. The medial mPFC inhibits stress responses and emotional reactivity in the amygdala and mediates extinction of conditioned fear through inhibition of acquired fear responses (Shin, Rauch, & Pittman, 2006). In addition, the

hippocampus plays a role in controlling the stress response, memory and contextual fear conditioning. Consequently, it is understood that this limited cognitive flexibility may cause difficulty in contextualizing and reinterpreting the traumatic event in ways that facilitate recovery. Chronic stress in addition to high glucocorticoid levels can damage the hippocampus causing a reduction in dendritic branching and impaired neurogenesis (Yehuda, 2001).

PTSD and Fibromyalgia. PTSD has been empirically associated with chronic widespread pain (Defrin, et al., 2008), temporomandibular pain (Afari, Wen, Buchwald, Goldberg, Plesh, 2008), mastalgia (Johnson, et al., 2006), fibromyalgia (Campbell, et al., 2008; Ciccone, et al., 2005), arthritis/rheumatism, back/neck pain, headaches, chronic pain, (Sledjeski, et al., 2008). When evaluating the prevalence of PTSD among FM patients (Cohen, et al., 2002) found that 57% of his sample displayed co-morbidity which is significantly higher than the general population. In fact, while controlling for sample bias, in a community-based sample of females affected by the World Trade Center attack, Raphael, Janal and Nayak (2004) found marked co-morbidity between symptoms of PTSD and FM in their sample. They found that the odds of having PTSD were three times greater in FM patients than in controls even after controlling for FM symptoms before the attack or for confounding symptoms of PTSD. When comparing controls to PTSD-only patients and PTSD patients with FM, Amir et al. (1997) found that PTSD patients reported more tenderness (measured both manually and by dolorimeter) than controls and PTSD patients with FM were more tender, reported more pain, lower quality

of life, and higher functional impairment and psychological distress than the PTSD-only patients.

When evaluating PTSD symptoms in FM patients Sherman, Turk, and Okifuji, (2000) found that 56% of the sample had PTSD, and those that displayed this co-morbidity reported significantly greater levels of pain, emotional distress, life interference and disability. The authors suggest that individuals with this co-morbidity may display difficulty in adapting to the illness. Although, Ciccone, et al. (2005) suggested that chronic stress in the form of PTSD may mediate the relationship between rape and FM. Also, structural equation modeling revealed that PTSD fully mediated the relationship between violence and physical health symptomatology and PTSD levels more strongly predicted pain-related physical health symptoms compared to non-pain health problems (Campbell, et al., 2008).

The stress response. The hypothalamic-pituitary-adrenal (HPA) axis is an organism's major neuroendocrine response system, which is activated upon exposure to a stressor. At that time, neurons in the hypothalamic paraventricular nucleus (PVN) secrete corticotropin-releasing factor (CRF) from the median eminence into the hypothalamo-hypophseal portal circulation. CRF is transported this way to the anterior pituitary where it stimulates the production and release of adrenocorticotropin (ACTH). ACTH then stimulates the release of glucocorticoids, including cortisol from the adrenal cortex of the adrenal gland. Glucocorticoids effect metabolism, the immune system, and the brain (Heim & Nemeroff, 2009).

Several pathways modulate HPA axis activity. The hippocampus and prefrontal cortex (PFC) act as inhibitors, while the amygdala stimulates HPA axis activity. Glucocorticoids exert feedback inhibition, or control of the HPA axis by regulating hippocampal and hypothalamic PVN neurons, as well as ACTH secretion. Continuous glucocorticoid exposure has negative effects on hippocampal neurons, including reduction in dendritic branching, loss of dendritic spines, and impairment of neurogenesis (Heim & Nemeroff, 2009).

Chronic Stress, trauma, and pain. There is a growing body of literature linking trauma, an extreme stressor, with disruptions of the nervous system as a result of extreme stressors and chronic stress. As pain is transmitted through the nervous system, this is important to consider. Early life traumatic events which occur during a period of neuronal plasticity have been demonstrated to cause permanent supersensitive neuroendocrine stress response systems in humans (Penza, Heim, & Nemeroff, 2003) and animals (Stam, 2007). In fact, women with a history of childhood sexual and physical abuse have been found to exhibit hyperactive autonomic nervous system responses and increased activation of the HPA axis (Heim, et. al., 2000).

Roelofs and Spinhoven (2007) reviewed a neurobiological model by Mayer et al. (2001) (as cited in Roelofs & Spinhoven, 2007), supporting changes in HPA axis reactivity in response to trauma, and proposed an integration of both the neurobiological model and psychological theory as the best possible explanation. While the Mayer et al. (2001) model was originally developed specifically as an explanation for irritable bowel

syndrome, it draws significantly from previous studies in patients with PTSD who have been found to show hypocortisolism, or low cortisol secretion, and increased feedback inhibition. Fries, Hesse, Hellhammer, and Hellhammer (2005) suggest that this may be due to hyperactivity of the HPA axis for prolonged periods of time. These authors also explain that low cortisol levels have been observed in patients with chronic fatigue syndrome, FM, and posttraumatic stress disorder and suggest that these disorders are characterized by a symptom triad of enhanced stress sensitivity, pain, and fatigue (Fries, et al., 2005). In support of this notion, patients with PTSD have demonstrated low baseline cortisol levels but increased cortisol levels after stress induction (Elzinga, Schmahl, Vermetten, van Dyck, & Bremner, 2003). While it is important to note the correlation between disruption of the HPA axis as a consequence of trauma and in relation to FM and other disorders, it is difficult to determine whether hypocortisolism is a cause or a consequence.

More interestingly, personally distressing environmental stressors (interpersonal and physical harm) have been found to coincide with the onset and maintenance of FM symptoms (Hamilton, et al., 2008; Anderberg, et al., 2000). FM is often considered a stress-related disorder, as many patients report that their symptoms occur after physiologic or psychological stress and are exacerbated during stress (Staud 2007). Williams and Clauw (2009) emphasize the importance of the biopsychosocial underpinnings of FM including environmental stressors, HPA axis/autonomic nervous system functioning, central sensitization and psychological factors.

In fact, Martinez-Lavin (2004) suggested that FM is a sympathetically maintained pain syndrome where relentless sympathetic hyperactivity causes dysautonomia and consequently neuropathic pain. This logic also provides an explanation for the features that usually accompany FM including sleep disruption, fatigue, paresthesias, headache, anxiety, and irritable bowel syndrome. Martinez-Lavin (2004) based his proposal on observations cited by Baron, Levine, and Fields (1999). These researchers noted that causalgia, intense burning and pain upon slight touch or vibration, and reflex sympathetic dystrophy, now referred to as complex regional pain syndrome I, were responsive to sympatholytic procedures and that the sympathetic efferent system was able to generate and enhance pain (Baron, et al., 1999). In addition, Bengtsson & Bengtsson (1988) demonstrated that sympathetic blockade, produced by a stellate ganglion blockade, produced marked decreases in tender points and resting pain in FM patients. Martinez-Lavin, et al. (2002) also found that more FM patients experienced pain upon norepinephrine injections when compared to rheumatoid arthritis patients and healthy controls. Other findings consistent with relentless sympathetic hyperactivity in FM include the analysis of heart rate variability (Cohen, et al., 2000; Martinez-Lavin, Hermosillo, Rosas, & Soto, 1998).

In a more recent article, Martinez-Lavin (2007) suggests a theoretical etiopathogenetic mechanism in FM where a genetic predisposition is aggravated by a triggering event which then affects neuroplasticity (possibly spinal cord sympathetic sprouting) and causing the neuropathic pain accompanying clinical features. In 2009,

Martinez-Lavin & Solano, also recognized the importance of genetic predisposition for enhanced excitability of the dorsal root ganglia in FM patients. Other researchers (Garcia-Fructuoso, Lao-Villadoniga, Beyer, & Santos, 2006; Gursoy, et al., 2003) have reported that subjects with FM less frequently have the 158-val genotype of the COMT gene, which induces a catecholamine-clearing enzyme which could predispose individuals to develop the condition. In addition, Vargas-Alarcon, et al. (2009) found adrenergic gene polymorphisms in FM patients, which sensitize the sympathetic nervous system, and concluded that these increase risk for developing the condition.

Statement of Purpose: While physiological measures were not taken in this study, it is understood that PTSD causes chronic stress in the body (Heim & Nemeroff, 2009) and that the stress response (i.e. activation of the HPA axis) is also occurring chronically in PTSD patients (Strawn & Geracioti, 2008). FM is also often considered a stress-related disorder, as many patients report that their symptoms occur after physiologic or psychological stress and are exacerbated during stress (Hamilton, et al., 2008; Staud, 2007; Anderberg, et al., 2000).). Therefore, by way of chronic activation of the autonomic nervous system, PTSD may help explain the association between FM and trauma as this anxiety disorder describes the psychological experience of a chronically stressed individual. Severity of trauma and age at which traumas were experienced are expected to influence this relationship.

Hypotheses:

1) The total number of traumatic life events (TNTE) will predict reported pain severity, such that the more traumatic life events the individual experienced the more pain will be reported.

2) PTSD (PCL-C scores) will mediate the relationship between TNTE and pain severity.

3) The perceived severity of trauma will moderate the relationship between TNTE and pain severity, such that events that are perceived as exceptionally traumatic will increase pain severity.

4) The age at which the trauma occurred will moderate the relationship between TNTE and pain severity. Trauma experienced in childhood (age 17 and younger) is expected to have a more severe effect on pain severity than trauma experienced in adulthood life.

CHAPTER III

METHOD

Participants

Participants included 26 individuals who self-reported having been diagnosed with FM by a physician and self-reported having experienced at least one traumatic life event during their lifetime. Twenty-five participants were female and one was male. Seventeen participants reported they were white, six Hispanic, one Asian, one Black, and one Other. Participants ranged in age from 25 years old to 70 with a median age of 44 years old.

Materials

The Traumatic Life Events Questionnaire (TLEQ; Kubany, et al., 2000) is a 23 item measure, which can be completed in 10-15 minutes, and is prefaced by the statement that traumatic events are rather commonplace. The first 22 items inquire about specific events such as motor vehicle accidents, war, sudden death of a close relative or friend, domestic violence, and childhood physical and sexual abuse. An example would be, "Were you physically punished in a way that resulted in bruises, burns, cuts, or broken bones?" The 23rd item is an open-ended item asking the subject to report any other traumatic event which may not have been previously mentioned. Each of the first 23 items includes a set of contingent follow-up questions to assess frequency of occurrence and severity of emotional consequences. The 24th item provides a list of all previously

mentioned traumatic events and asks the responder to choose the event that was most distressing, the age when it first occurred, when it last occurred and what degree of distress it caused. The TLEQ demonstrated adequate reliability and validity during its development (Kubany, et al., 2000) and was used as a standard of comparison in developing the Life Events Checklist (Gray, Litz, Hsu, & Lombardo, 2004). The TLEQ can be seen in its entirety in Appendix A.

Creation of Additional Variables

Several variables were derived from the TLEQ responses and used in analyses. The TNTE was derived by summing the number of times each participant reported having experienced a traumatic event on each item from the TLEQ. If a participant affirmed having experienced a traumatic event then the questionnaire had follow up questions including an item that asked, "Did you experience intense fear, helplessness, or horror when it happened?" The number of times this question was marked yes was used for a subsequent measure of trauma in order to distinguish events each participant considered exceptionally traumatic, and is hereafter described as Helplessness/Horror (H/H). The number of traumas experienced in childhood (NTEC) was derived by summing the number of times each participant reported having experienced a traumatic event on item numbers 12, 13, 15-17. Item's 12 and 13 are prefaced by the phrase, "While growing up," items 15 and 16 are prefaced by the phrase: "Before your 13th birthday" while item 17 leads with: "After your 13th birthday but before your 18th birthday". These five items ask questions about the participants' experiences with family

violence, physical abuse, and sexual abuse. The final question of the TLEQ asks responders to mark the "one event that causes you the most distress" and follows with blanks where the participant can indicate when the event first occurred and when it last occurred. The date the event first occurred was used in combination with each participant's age in order to determine the age at which the participant experienced his or her most traumatic event.

The Brief Pain Inventory (BPI; Cleeland & Ryan, 1994) was used to assess participants' experience of pain and the level of disturbance caused in their lives. The Pain Research Group of the World Health Organization Collaborating Centre for Symptom Evaluation in Cancer Care developed the BPI. It has been used in countries all over the world for clinical pain assessment as it has demonstrated reliability and validity across various cultures and languages. It consists of 9 questions and can be completed in less than 10 minutes. The BPI includes 3 subscales: Pain, Activity interference, and Affect interference. An example item is: Please rate your pain by circling the one number that best describes your pain at its worst in the last 24 hours. Response choices are numbers 0 through 10, where 0 is marked "no pain" and 10 is marked "pain as bad as you can imagine." (Cleeland & Ryan, 1994). The BPI is reproduced in Appendix B.

The PTSD Checklist – Civilian Version (PCL-C) was used to assess PTSD symptoms. The PCL-C is aligned with DSM-IV criteria and consists of 17 items, which can be completed in less than 5 minutes. A sample item is: "Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?" The responses

are numbered in a Likert scale fashion where 1 is marked not at all, 2 is marked "a little bit", 3 "moderately", 4 "quite a bit", and 5 "extremely". It was administered in a paper-and-pencil format. When compared to the Structured Clinical Interview for DSM-IV, Nonpatient Version, PTSD module the PCL-C resulted in a sensitivity of .60 and a specificity of .99 and was recommended as a cost-effective screening tool for PTSD diagnosis. A cutoff score of 50 or higher on the PCL-C is a good predictor of PTSD diagnosis (Andrykowski, Cordova, Studts, & Miller, 1998). The PCL-C can be viewed in Appendix C.

Design. This study involves a correlational design. As a continuous variable, TNTE were expected to predict pain severity. Also PCL-C scores were treated as a continuous variable and were expected to mediate the relationship between number of traumatic life events and severity of pain from FM.

Trauma → PTSD → Severity of pain reports

In addition, perceived severity of trauma (H/H) and age of individual at the time the trauma occurred (both NTEC and age of MTE) were expected to moderate the relationship of TNTE with pain severity.

Procedure. Approval was first sought and obtained from the Institutional Review Board at Texas State University - San Marcos as human subjects were used for this study. Participants were recruited in two psychologists' offices, a pain treatment center, and through an online support group for FM patients. The web address for this support group

is www.mdjunction.com/fibromyalgia. Eleven participants were recruited out of the two psychologists' offices, two out of the pain treatment center, and 13 from the online support group. Flyers as well as verbal enrollment by the health professional at each office were used as methods of recruitment in the offices while an online synopsis of the inclusion criteria and purpose of the study were used for recruitment online. Both flyers and online synopsis included the investigator's contact information for questions and additional information. The study flyer is shown in Appendix D.

All participants were briefed on the general purpose of the study. They were required to affirm meeting the inclusion criteria and then signed a consent form is presented in Appendix E. Participants were given the packet of questionnaires and instructed to complete the questionnaires in a quiet environment to allow for concentration. Separate envelopes were provided to participants recruited over the internet so that they were able to mail back their consent forms and completed questionnaires separately and they were discouraged from writing their names on the questionnaires and on return envelopes in order to ensure confidentiality. Seven participants were sent questionnaires, but did not return them. Upon completion of the questionnaire, a $5 gift card to a discount store was provided to participants.

CHAPTER IV

RESULTS

Power Analysis

A power analysis was performed in order to determine the required sample size for a regression analysis. Based on an alpha level of .05, statistical power of .9976, and 1 predictor variable, the desired sample size for this study was 26 participants.

Sample Characteristics

Descriptive statistics for the entire sample of participants including age and composite scores derived from all three measures (TLEQ, PCL-C, and BPI) were calculated. See Table 1. As previously mentioned, the age of participants ranged from 25 to 70 years, with a mean age of 44 and a standard deviation of 13.690.

The four variables derived from the TLEQ included TNTE, H/H, NTEC, and age of MTE. The maximum number of TNTE able to be reported on the TLEQ is 138. This would result if the respondent answered yes to all possible traumas and indicated having experienced each traumatic event more than 5 times. TNTE for this sample ranged from 6 to 58, with a mean of 22.62 and a standard deviation of 13.173. All participants reported having experienced at least one event during which they experienced intense fear, helplessness, or horror (H/H variable), while not all participants reported having experienced a childhood trauma. The age of the MTE ranged from age 2 to 53, with a mean age of 18.81 and a standard deviation of 14.964.

The maximum PCL-C score is 85 and the minimum score is 17. PCL-C scores ranged from 17 to 79, with a mean of 48.69 and a standard deviation of 15.54. A total of 15 out of the 26 participants, or 57% of the sample, had a PCL-C score of 50 or higher (the cutoff score for PTSD), which is the same as the 57% PTSD that Cohen, et al. (2002) found among FM patients and similar to the 56% that Sherman, et al. (2000) found.

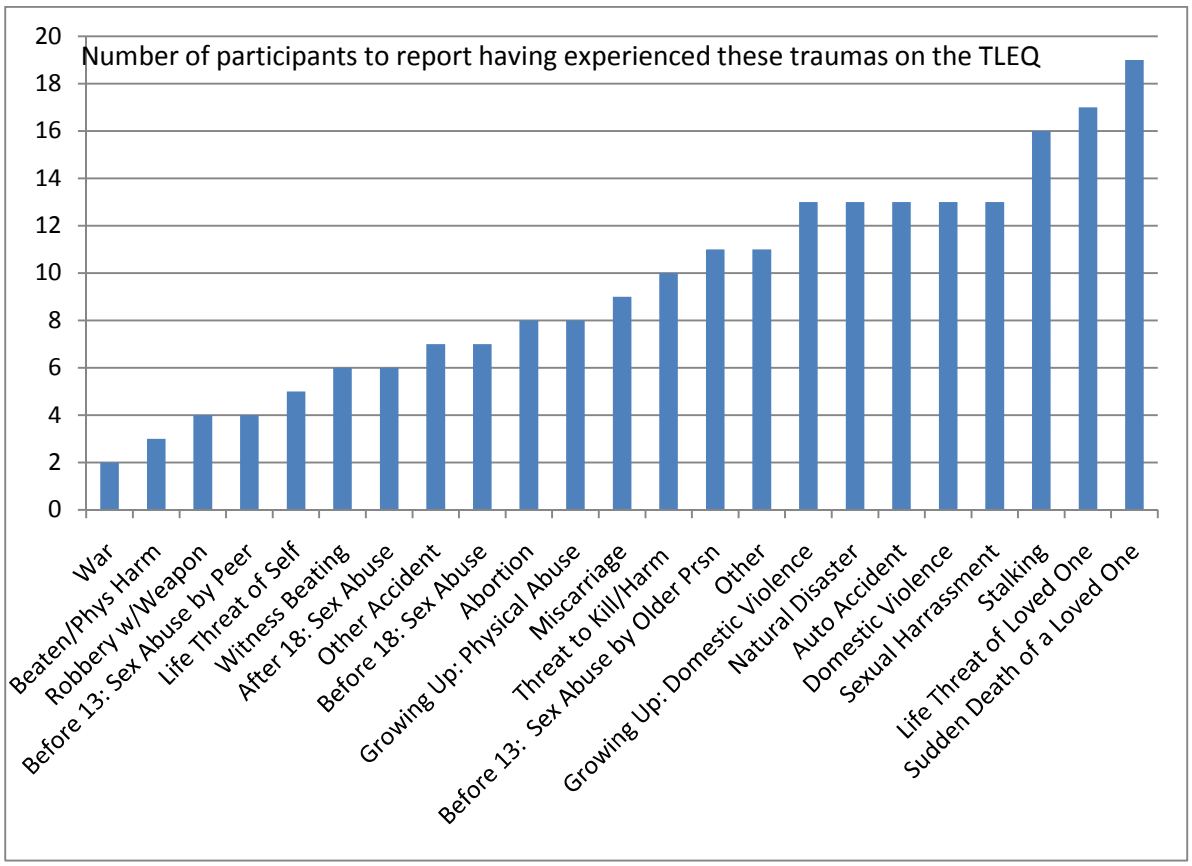
Pain severity reports on the BPI can range from four to 40. The range for this sample was a minimum of nine and a maximum of 40, with a mean of 24.44 and a standard deviation of 7.728. Total pain interference scores on the BPI range from zero to 70. The scores for this sample ranged from three to 70 with a mean of 44.67 and a standard deviation of 18.356. Total pain interference is included for complete report of scales, but was not included in the hypotheses nor was it significantly related to any other variables. Consequently, it is not discussed further in the subsequent analyses.

Table 1. Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Age	25.00	70.00	43.923	13.699
TNTE	6.00	58.00	22.615	13.172
NTEC	0.00	18.00	6.230	5.331
HH	2.00	15.00	6.423	3.700
MTEAge	2.00	53.00	18.807	14.964
PCL-C	17.00	79.00	48.692	15.548
Pain Severity	9.00	40.00	24.442	7.728
Pain Interference	3.00	70.00	44.673	18.355

As previously described, the TLEQ itemizes 22 specific types of traumas. A bar graph indicating the number of participants who reported having experienced the specific types of traumas described in the TLEQ can be seen in Table 2 below. Sudden death of a loved one was reported most often, as 19 of the 26 participants reported having experienced this trauma. Threat of life of a loved one was reported by 17 participants, and stalking was reported by 16 participants. Sexual harassment, domestic violence, automobile accidents, natural disasters, and domestic violence were all reported by half the sample. The types of traumas reported least frequently were: war/combat (2), having been beaten or physically harmed (3), robbery with a weapon (4) and sexual abuse by a peer prior to age 13 (4). Eleven participants reported another type of trauma that was not included in the 22 traumatic events described by the TLEQ. No trend or pattern was noted in the types of events reported in the “other” item.

Table 2. Number of participants to report each item on TLEQ



Statistical Analyses

Microsoft Excel was used to enter data from the individual measures (TLEQ, PCL-C, and BPI) as well as to calculate composite scores for the variables previously described. Afterward, IBM's Predictive Analytics Software (PASW) version 18.0 was used for all statistical analyses of composite scores.

Correlations for each of the variables can be seen in Table 3 below. Most notably, PCL-C scores were positively related to pain severity, r=.521, p=.01. TNTE was not significantly related to pain severity; however, it was significantly related to PCL-C

score, r=.442, p = 0.05. In addition, TNTE was significantly related to NTEC and H/H (p = 0.01). NTEC was also positively related to H/H (p = 0.01) and negatively related to age of MTE (p = 0.05). Finally, age was significantly related to age of MTE, r=.567, p = 0.01.

Table 3. Correlations of all study variables

	Age	TNTE	NTEC	H/H	Age MTE	PCL-C	Pain Severity
Age	1						
TNTE	-0.149	1					
NTEC	-0.347	0.774**	1				
H/H	-0.096	0.881**	0.727**	1			
Age MTE	0.567**	-0.335	-0.553*	-0.341	1		
PCL-C	0.012	0.442*	0.158	0.339	0.090	1	
Pain Severity	-0.033	0.294	0.115	0.140	-0.017	0.521**	1

**.Correlation is significant at the 0.01 level (2-tailed)
*.Correlation is significant at the 0.05 level (2-tailed)

The first hypothesis was that TNTE would predict pain severity reports of patients experiencing FM, such that the more traumatic life events an individual experienced the more pain severity would be reported. However, the linear regression for TNTE predicting pain, was not significant, R^2 = 0.086, F (1, 25) = 2.265, p = 0.145. Since TNTE was not predictive of pain severity reported, the third hypothesis of the moderating effect of exceptionally traumatic events (H/H) on the relationship between number of

traumatic events and pain severity could not be tested. However H/H was tested for predictive value. This variable was also not found to be predictive of pain severity, R^2 = 0.020, F (1, 25) = 0.480, p = 0.495.

The second hypothesis was that PTSD (PCL-C scores) would mediate the relationship between TNTE and severity of pain reports. Baron and Kenny (1986) discussed four steps in establishing mediation, where X (criterion variable) predicts Y (outcome variable) through M (mediator). Step one is to demonstrate that the criterion variable (TNTE) is correlated with the outcome (pain severity) with a regression equation in order to establish that there is an effect to be mediated. However, TNTE did not predict pain severity in this sample. The second step is to show that the criterion variable (TNTE) is correlated with the mediator (PCL-C score) by using the mediator as an outcome variable in the regression. TNTE did predict PCL-C scores, R^2 = 0.195, F (1, 24) = 5.84, p = 0.0236. Step three requires that both the criterion variable (TNTE) and mediator (PCL-C score) are able to predict the original outcome variable (pain severity) in a multiple regression. A multiple regression using both TNTE and PCL-C scores to predict pain severity was conducted, R^2 = .276, F (1, 24) = 4.386, p = .024, where TNTE, B = 0.79, p = .694 and PCL-C Score had a B = .486, p = .022. The two variables were able to predict pain severity together; however, the fourth and final step requires that the effect of the criterion variable (TNTE) on the outcome variable (pain severity) be zero after controlling for the mediator variable (PCL-C score). The authors explain that this final requirement should be viewed as a continuum, so that the elimination of a

relationship between the criterion and outcome variables would denote absolute mediation, but a reduction would indicate multiple mediating variables. They also mention that in field of psychology, phenomena often have multiple cases, so a more realistic goal would be to seek mediating variables that significantly reduce the relationship between the criterion and outcome variables. Consequently, the second hypothesis was not supported as the data failed to demonstrate the necessary relationships for steps one and four. However, it is noteworthy that PCL-C scores alone predicted pain severity, $R^2 = .271$, F (1, 24) = 8.928, $p = 0.006$.

The fourth hypothesis was that the age at which trauma occurred would moderate the relationship between TNTE and pain severity reports. Trauma experienced in childhood (age 17 and below) was expected to have a more severe effect on pain reports than trauma experienced in adulthood. As the first hypothesis was negated, NTEC was used to predict pain severity, and was not found to be a significant predictor, $R^2 = .013$, F (1, 24) = 0.321, $p = .576$. In addition, the age of the MTE, as a continuous variable, was also not predictive of pain severity, $R^2 = .00029$, F (1, 24) = 0.0069, $p = 0.934$.

A multiple regression was also used to test the influence of all predictor variables on pain severity including: TNTE, H/H, NTEC, and the age of the MTE. Using this model the $R^2 = .17$, F (1, 25) = 1.074, $p = .394$. The beta weights and significance levels are summarized in Table 4. In this model, the TNTE appears to explain the most variance in pain severity and is approaching statistical significance ($B = .902$, p = .067),

while H/H, *B* = .89 is not significant. NTEC and the age of the MTE explain the least amount of the variance.

Table 4. Beta weights and significance levels for multiple regression of whole group

Predictor variable	*B*	Significance
Total number of traumas	0.902	.067
Childhood traumas	-0.234	.525
Helplessness/Horror	0.890	.264
Age of MTE	-0.012	.962

In order to further develop the fourth hypothesis a post-hoc analysis of the data was conducted where the sample was divided into two groups: those that experienced their MTE before the age of 18 (Childhood MTE) and those that experienced their MTE at age 18 or older (Adulthood MTE). There were 12 people that experienced their MTE in adulthood and 14 that experienced it in childhood. The adulthood MTE subgroup was older with an average of 50.75 years compared to an average of 38.07 years in the childhood MTE subgroup. All variables derived from the TLEQ (TNTE, NTEC, and H/H) were higher in the childhood MTE subgroup. However, PCL-C scores and pain severity were both higher in the adulthood MTE subgroup. In fact, nine of the 15 participants that fell in the PTSD range for PCL-C scores were found in the adulthood MTE subgroup.

Table 5. Descriptive Statistics for each subgroup

Adulthood MTE	Minimum	Maximum	Mean	Std. Deviation
Age	28.00	70.00	50.75	13.59
TNTE	6.00	51.00	20.91	13.68
NTEC	.00	12.00	3.83	4.87
H/H	2.00	14.00	5.66	3.55
MTE Age	19.00	53.00	31.83	11.67
PCL-C	17.00	79.00	52.58	16.62
Pain Severity	13.00	40.00	27.25	8.37
Childhood MTE	Minimum	Maximum	Mean	Std. Deviation
Age	25.00	59.00	38.07	11.16
TNTE	7.00	58.00	24.07	13.05
NTEC	.00	18.00	8.28	4.96
H/H	3.00	15.00	7.07	3.83
MTE Age	2.00	16.00	7.64	4.93
PCL-C	17.00	71.00	45.35	14.31
Pain Severity	9.00	29.50	22.03	6.47

After the composite scores were split by group, linear regressions were conducted for each of the hypotheses. None of the regressions run for the childhood MTE subgroup were significant. The results of the regressions are summarized in Table 6.

Table 6. Summary of regressions for Childhood MTE subgroup

Predictor Variable	**Outcome Variable**	***B***	**R^2**	**F**	**df**	**Sig. F**
TNTE	Pain Severity	.138	.019	.233	1, 12	.638
H/H	Pain Severity	.085	.007	.088	1, 12	.772
NTEC	Pain Severity	-.087	.008	.092	1, 12	.766
Age of MTE	Pain Severity	-.499	.249	3.977	1, 12	.069
PCL-Score	Pain Severity	.336	.113	1.527	1, 12	.240
TNTE	PCL-Score	.317	.101	1.342	1, 12	.269
H/H	PCL-Score	.388	.150	2.126	1, 12	.170
NTEC	PCL-Score	.358	.128	1.76	1, 12	.209
Age of MTE	PCL-Score	-.240	0.58	.734	1, 12	.408

The adulthood MTE subgroup had two significant findings. First, TNTE predicted pain severity reports, R^2 = 0.477, $F(1, 11) = 9.135$, p = 0.0128, B = 0.568. Second, PCL-C score predicted pain severity reports, R^2 = 0.3583, $F(1, 11) = 5.582$, p = 0.039, B = 0.599. In addition, a multiple regression using both TNTE and PCL-C scores to predict pain severity was conducted, R^2 = .470, F (1, 24) = 5.882, p = .023, where TNTE, B = 0.523, p = .067 and PCL-C Score had a B = 0.342, p = .207. Mediation steps one, two, and three previously described from Baron and Kenny (1986) are upheld;

however, step four was not upheld as TNTE still has a beta weights in the multiple regression. While the beta for TNTE did decrease in the multiple regression, the difference was not substantial.

CHAPTER V

DISCUSSION

The current thesis centers on the biopsychosocial underpinnings of FM, focusing specifically on the importance of trauma in the onset of the condition as well as an individual's perception of severity of threat as measured by the H/H variable as well as PTSD symptomatology.

Hypotheses and Research Findings. Previous research has indicated that the number of traumatic life events explained the relationship between chronic pain and PTSD (Sledjeski, et al., 2008). The analysis of the data from the present study did not reveal a significant relationship between TNTE and pain severity. Since all subsequent hypotheses were based upon the mediation and moderation of this relationship, none of the hypotheses were supported by the results. In addition, the H/H and NTEC variables that were expected to moderate the relationship between TNTE and pain severity were also unable to predict pain severity by themselves.

Analyses did reveal that TNTE predicted PTSD symptomatology, and this finding seems intuitive. Second, the results demonstrate the predictive power of PTSD symptomatology for pain severity. This finding aligns with previous research which has shown that PTSD has been positively linked to pain (Afari, et al., 2008; Campbell, et al., 2008; Defrin, et al, 2008; Johnson, et al., 2006; Ciccone, et al., 2005). Collectively, these

significant findings suggest that PTSD symptomatology alone is most closely linked to pain severity.

Other significant findings were uncovered when splitting the sample into two subgroups based on whether they experienced their MTE during adulthood or childhood. The adulthood MTE subgroup demonstrated two predictive relationships: TNTE predicted pain severity and PTSD predicted pain severity, while the childhood MTE subgroup displayed none. The significant findings in the adulthood MTE subgroup are rather counterintuitive as previous research has indicated the importance of childhood traumas in sensitizing the individual and the nervous system to trauma later in life (Penza, et al., 2003). In addition, NTEC was negatively related to age of MTE, indicating that the age of the most traumatic event increased while number of traumatic events experienced in childhood decreased and vice versa. This negative relationship aligns well with the descriptive statistics found upon splitting the sample by age of MTE, as the childhood MTE subgroup had more NTEC when compared to the adulthood MTE subgroup. So, individuals with an older age of MTE had less NTEC. This is further supported by age being positively related to age of MTE ($r=.567$, $p=.01$), which suggests that participants tended to indicate more recent experiences as more traumatic than those experienced further back in their personal histories.

It is worth considering that the adulthood MTE subgroup was older (50.75 years) on average when compared to the whole sample (43.92 years) and to the childhood MTE subgroup (38.07 years). At first it seemed that as an older group, the adulthood MTE

subgroup may have had the opportunity to experience more traumatic events; however, the childhood MTE subgroup had a higher average of TNTE. One possible reason for this finding is that the cumulative effect of traumatic events is more telling with age. As an older group general aches and pains in the body may be amplified because of the history of traumatic events. More interestingly, nine of the 12 adulthood MTE subgroup participants, or 75%, of this subgroup had PCL-C scores within PTSD diagnosis range. Only six of the 14 childhood MTE subgroup participants, or 42.9%, had PTSD level PCL-C scores. Here again, higher levels of PTSD symptomatology seem to be most critical in predicting pain severity.

While no physiological measures were taken, certain physiological underpinnings are assumed. As aforementioned, it is understood that PTSD causes chronic stress in the body (Heim & Nemeroff, 2009) and that the stress response (i.e. sympathetic activation and activation of the HPA axis) is also occurring chronically in PTSD patients (Strawn & Geracioti, 2008). Consequently, the chronic activation of the autonomic nervous system that is implicit in PTSD patients coincides with the dysautonomia, or hyperactivity and consequent disruption in functioning of the autonomic nervous system, described in Martinez-Lavin (2004). As described in his model, this chronic activation of the sympathetic nervous system helps explain the neuropathic pain seen in fibromyalgia as well as the accompanying gastrointestinal problems such as irritable bowel syndrome, paresthesias, difficulty sleeping, headache, anxiety, and fatigue that are frequently observed in FM patients.

The results of this study do not provide definitive answers for questions regarding the nature of the relationship between trauma and FM, but they do support the growing body of literature maintaining the strong relationship between PTSD and FM (Ciccone, et al., 2005; Campbell, et al., 2008). One possible explanation is that PTSD has a causal role in the development of FM. As previously discussed, PTSD symptomatology is a normal response after a traumatic event; it is when these symptoms persist for a month after trauma exposure that PTSD can be diagnosed (Adams & Boscarino, 2006). Since traumatic events have been associated with the onset of FM (ACR, 2010; CDC, 2010; Walen, et al., 2001; Hamilton, et al., 2008; Anderberg, et al., 2000) individuals may experience varying lengths of adjustment periods after the traumatic event. While PTSD symptoms may subside the initial chronic stress may have dysregulated the sympathetic nervous system leaving neuropathic pain.

Another explanation is that PTSD may only exacerbate the pain symptoms of FM. The individual may have insufficient coping strategies as suggested in Sherman, et al. (2000) and consequently experience increased stress responses in the nervous system thereby exacerbating pain severity. A combination of the previous two explanations is that PTSD symptoms may trigger the onset of FM and anxiety/stress levels experienced afterward may maintain the FM symptomatology.

Yet another plausible explanation is that FM may predispose individuals to PTSD as suggested by the evaluation of reports by the community sample of FM patients before and after the World Trade Center attack in Raphael, et al. (2004). This type of

predisposition may be explained similarly in that a stressful event may trigger the onset of FM causing physiological changes, which then increase the likelihood of the development of PTSD. Finally, there may be an underlying genetic predisposition for both conditions that may manifest itself differently depending on the triggering event and/or other genetic factors.

Implications. These findings indicate that it is not the number of traumas, the age at which the traumas were experienced, nor the perception of severity of those traumatic events, but PTSD symptomatology alone that is most closely related to pain severity in FM patients. Since PTSD symptoms so closely mirrored pain severity, treating PTSD symptoms in FM patients might help them with better management of the condition and better quality of life.

Goldenberg, Burkhardt, and Crofford, (2004) reviewed 505 articles covering the treatment and management of FM. At the time, no medical therapy existed for FM; however, management of the condition included low dose tricyclic antidepressants, cardiovascular exercise, cognitive behavioral therapy, and patient education. They also made note that several studies have found improved function in FM patients as a product of meditation, relaxation and stress management. Interestingly, all but patient education has a direct effect on the sympathetic nervous system. In particular, cognitive and behavioral therapies have been noted for possible effectiveness in the prevention and/or reversal of long-term changes in synaptic transmission in the spinal cord through

descending pain pathways, which inhibit nociception (Rygh, Rjolsen, Hole, & Svensen, 2002).

In an article reviewing pharmaceutical treatment of FM, Dussias, Kalali, and Staud (2010) found that the pregabalin (Lyrica), a drug previously described for neuropathic pain in diabetic patients, was prescribed most often to FM patients. Staud (2010) also noted that, in combination with pharmacological treatment, exercise, cognitive behavioral therapies and self-management strategies may be necessary to achieve satisfactory outcomes as only half of FM patients treated with selective serotonin-norepinephrine reuptake inhibitors experienced a 30% reduction symptoms. Here again, the additional therapies suggested by Staud (2010) all effect the sympathetic nervous system and help regulate stress.

Future Research. Future research would do well to pick apart the intricacies of the relationship between PTSD and FM. To elaborate upon this study, it would be useful to assess the existence of PTSD symptoms after trauma in individuals that have FM. This could be achieved in a longitudinal fashion by having individuals that have experienced trauma report PTSD and pain symptoms for a certain period of time after the trauma. Another manner of achieving this assessment would be having FM patients recall any PTSD symptoms after traumatic events in their personal histories. In addition, comparing neurological trends of FM and PTSD by further analysis of fMRI images, heart rate vulnerability, and the effects of SSRIs and benzodiazepines on controlling symptoms may help elucidate the role the nervous system plays in the onset and maintenance of

symptoms for both of these conditions. Finally, reviewing the results of such studies for aggregates or trends in accompanying features and comorbidities could also be useful in identifying subtypes of FM.

Limitations. The significant relationships between the TNTE, H/H, and NTEC should be noted with caution as they are all derived from the TLEQ. NTEC is a subset of TNTE where particular items were pulled into a separate variable because of the leading phrase for each of the designated items specified if the event occurred during childhood. H/H is also subset of TNTE where all items that are marked yes and then subsequently marked as causing intense fear, helplessness or horror were pulled to create a separate variable. Consequently, it is expected that these variables would correlate with one another.

While the TLEQ was chosen for its inclusiveness and brevity, the data collected from the measure was limiting in several ways. While items 12, 13, and 15-17 are prefaced with clauses that ask specifically about events occurring during childhood, other items do not include follow up questions to verify if the event may have also occurred during childhood. Consequently, the actual number of childhood traumas was limited to those specific questions. Specifically, items 12 and 13 lead with, "While growing up," items 15 and 16 lead with, "Before your 13th birthday," and item 17 leads with, "After your 13th birthday and before your 18th birthday." No other items use similar language or ask follow up questions about the time the event occurred in the individual's life.

In addition, each TLEQ question is followed by a series of follow up questions, the first being, "If yes, how often" to which the participant may respond: once, twice, three times, four times, five times, or more than five times. The number of times the participant reported experiencing each traumatic event in the questionnaire was added together for a sum total number of traumatic events. Participants who marked more than 5 times had the number 6 included toward their total. This forced choice option was limiting because only a maximum number of 6 was able to be used for analysis. However, in order to control for any limitation, secondary analysis was performed where any item marked with "more than 5 times" was modified in increments of 3 to see if the relationships between total number of traumas and other variables were affected, and there was no significant difference demonstrated when this analysis was done.

Originally the participants were to be recruited out of one office where medical records could be reviewed in order to confirm FM diagnosis. However, the original office did not have a significant number of FM patients at the time of recruitment and so other offices and methods of recruitment were sought. Consequently, the review of medical records was not possible for the majority of the participants in order to confirm FM diagnosis. However, the participants were required to self-report having been diagnosed with FM by a physician.

Another limitation of the study was the sample size. The statistical power for this sample size was originally calculated for a simple linear regression. After the data was collected, and analyses were conducted it was found that a much larger sample would

have been necessary for all the steps described in Baron and Kenny (1986). According to Fritz and MacKinnon (2007) a 75% of the studies they reviewed did not have adequate sample sizes and they noted that a sample of 20,886 is required to test for mediation as described in Baron and Kenny (1986). Subgroups of the sample could have been evaluated based on types of trauma and participants that had PTSD versus those that did not.

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APPENDIX A

TLEQ

Edward S. Kubany, Ph.D., and Stephen N. Haynes, Ph.D

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Name: _____ Date: _____

ID #: _____ Age: _____ Gender: ☐ Female ☐ Male

Race/Ethnicity: ☐ American Indian/Alaska Native ☐ Asian ☐ Black/African American ☐ Hispanic/Latino ☐ Native Hawaiian/Pacific Islander ☐ White ☐ Other

Education (last year completed): ☐ <12 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ >16

TRAUMATIC LIFE EVENTS

The purpose of this questionnaire is to identify important life experiences that can affect a person's emotional well-being or later quality of life. The events listed below are far more common than many people realize. Please read each question carefully and check the response that best describes your experience. Then check *yes* or *no* for each follow-up question. Be sure to complete the entire form unless your examiner has asked you to complete only the unshaded areas.

1. **Have you ever experienced a natural disaster (flood, hurricane, earthquake, etc.)?**
   ☐ no ☐ yes

   If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

   If this happened:
   Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

   Were you seriously injured? ☐ yes ☐ no

   Was someone you cared about or were close to seriously injured or killed? ☐ yes ☐ no

   Did you think you or a loved one was in danger of being killed by the disaster? ☐ yes ☐ no

2. **Were you involved in a motor vehicle accident for which you received medical attention or that badly injured or killed someone?**
   ☐ no ☐ yes

   If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

   If this happened:
   Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

   Were you seriously injured? ☐ yes ☐ no

3. **Have you been involved in any other kind of accident in which you or someone else was badly hurt?**
   (examples: a plane crash; a drowning or near drowning; an electrical or machinery accident; an explosion, home fire, or chemical leak; overexposure to radiation or toxic chemicals)
   ☐ no ☐ yes

   If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

   If this happened:
   Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

   Were you seriously injured? ☐ yes ☐ no

4. **Have you lived, worked, or had military service in a war zone?**
   ☐ no ☐ yes

   If yes, were you ever exposed to warfare or combat?
   (examples: being in the vicinity of a rocket attack or people being fired upon; seeing someone get wounded or killed)
   ☐ no ☐ yes

   If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

   If this happened:
   Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

   Were you seriously injured or wounded? ☐ yes ☐ no

5. **Have you experienced the sudden and unexpected death of a close friend or loved one?**
   ☐ no ☐ yes

   If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

   Due to **accident?** ..... ☐ yes ☐ no

   illness? ..... ☐ yes ☐ no

   suicide? ..... ☐ yes ☐ no

   murder? ..... ☐ yes ☐ no

   If this happened:
   Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

continued on next page...

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6. **Has a loved one ever survived a life-threatening or permanently disabling accident, assault, or illness?**
(examples: spinal cord injury, rape, cancer, life-threatening virus, serious heart condition)
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

7. **Have you ever had a life-threatening illness?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

8. **Have you been robbed or been present during a robbery in which the robber(s) used or displayed a weapon?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

Were you seriously injured? ☐ yes ☐ no

9. **Have you ever been hit or beaten up and badly hurt by a stranger or someone you didn't know very well?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

Were you seriously injured? ☐ yes ☐ no

10. **Have you seen a stranger (or someone you didn't know very well) attack or beat up someone and seriously injure or kill him or her?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

11. **Has anyone threatened to kill you or cause you serious physical harm?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

Was this person **a stranger?** ..... ☐ yes ☐ no
a friend or an acquaintance? ..... ☐ yes ☐ no
a relative? ..... ☐ yes ☐ no
an intimate partner? ..... ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

12. ***While growing up:*** **Were you physically punished in a way that resulted in bruises, burns, cuts, or broken bones?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

13. ***While growing up:*** **Did you see or hear family violence?**
(such as your father hitting your mother, or any family member beating up or inflicting bruises, burns, or cuts on another family member)
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

14. **Have you ever been slapped, punched, kicked, beaten up, or otherwise physically hurt by your spouse (or former spouse), a boyfriend or girlfriend, or some other intimate partner?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times ☐ twice ☐ 5 times ☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

Were you seriously injured? ☐ yes ☐ no

Has more than one intimate partner physically hurt you? ☐ yes ☐ no

If yes, how many hurt you? _____

continued on next page...

15. *Before your 13th birthday:* Did anyone who was *at least 5 years older than you* touch or fondle your body in a sexual way or make you touch or fondle his or her body in a sexual way?
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was the person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a parent or caregiver? ☐ yes ☐ no
a relative? ☐ yes ☐ no
Were threats or force used? ☐ yes ☐ no
Were you seriously injured? ☐ yes ☐ no
Was there oral, anal, or vaginal penetration? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

16. *Before your 13th birthday:* Did anyone *close to your age* touch sexual parts of your body or make you touch sexual parts of his or her body *against your will or without your consent?*
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was this person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a relative? ☐ yes ☐ no
Were threats or force used? ☐ yes ☐ no
Were you seriously injured? ☐ yes ☐ no
Was there oral, anal, or vaginal penetration? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

17. *After your 13th birthday and before your 18th birthday:* Did anyone touch sexual parts of your body or make you touch sexual parts of his or her body *against your will or without your consent?*
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was this person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a relative? ☐ yes ☐ no
an intimate partner? ☐ yes ☐ no
Were threats or force used? ☐ yes ☐ no
Were you seriously injured? ☐ yes ☐ no
Was there oral, anal, or vaginal penetration? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

18. *After your 18th birthday:* Did anyone touch sexual parts of your body or make you touch sexual parts of his or her body *against your will or without your consent?*
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was this person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a relative? ☐ yes ☐ no
an intimate partner? ☐ yes ☐ no
Were threats or force used? ☐ yes ☐ no
Were you seriously injured? ☐ yes ☐ no
Was there oral, anal, or vaginal penetration? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

19. **Were you ever subjected to uninvited or unwanted sexual attention?**
(*other than* sexual contact covered by Items 15, 16, 17, and 18)
(examples: touching, cornering, pressure for sexual favors, verbal remarks)
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was this person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a relative? ☐ yes ☐ no
a supervisor or coworker? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

20. **Has anyone stalked you (in other words, followed you or kept track of your activities), causing you to feel intimidated or concerned for your safety?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ twice ☐ 3 times ☐ 4 times ☐ 5 times ☐ more than 5 times

Was this person **a stranger?** ☐ yes ☐ no
a friend or an acquaintance? ☐ yes ☐ no
a relative? ☐ yes ☐ no
an intimate partner? ☐ yes ☐ no

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

continued on next page...

21. **Have you or an intimate partner ever had a miscarriage?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times
☐ twice ☐ 5 times
☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

Did it (ever) happen after you were physically injured? ☐ yes ☐ no

22. **Have you or an intimate partner ever had an abortion?**
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times
☐ twice ☐ 5 times
☐ 3 times ☐ more than 5 times

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

23. **Have you experienced (or seen) any other events that were life threatening, caused serious injury, or were highly disturbing or distressing?**
(examples: lost in the wilderness; a serious animal bite; violent death of a pet; being kidnapped or held hostage; seeing a mutilated body or body parts)
☐ no ☐ yes

If yes, how often? ☐ once ☐ 4 times
☐ twice ☐ 5 times
☐ 3 times ☐ more than 5 times

Please describe:

_____

_____

_____

_____

_____

If this happened:
Did you experience intense fear, helplessness, or horror when it happened? ☐ yes ☐ no

Were you seriously injured? ☐ yes ☐ no

24. **The events listed below correspond to Items 1 to 23 on this questionnaire. If any of these events happened to you, circle the number next to the *one* event that causes you the most distress. Make sure you circle only one number.**

1. Natural disaster
2. Motor vehicle accident
3. "Other" kind of accident
4. Warfare or combat
5. Sudden death of a close friend or loved one
6. Life-threatening or disabling event experienced by a loved one
7. Life-threatening illness
8. Robbery/weapon used
9. Assaulted by an acquaintance or a stranger
10. Witnessed severe assault of an acquaintance or a stranger
11. Threatened with death or serious harm
12. *Growing up:* was physically punished
13. *Growing up:* witnessed family violence
14. Physically hurt by intimate partner
15. *Before 13:* sexual contact with someone at least 5 years older
16. *Before 13:* unwanted sexual contact
17. *As a teen:* unwanted sexual contact
18. *As an adult:* unwanted sexual contact
19. Sexual harassment
20. Stalked
21. Miscarriage
22. Abortion
23. Some "other" traumatic event
24. None of these events happened to me

(a) When did this event first occur? (your age or date)

_____

(b) When did this event last occur?
(try to be precise; e.g., year, month, day)

_____

(c) How much distress (anxiety, worry, sadness, frustration, or grief) does this event cause you? *(Check the best answer.)*

☐ None happened to me ☐ Moderate distress
☐ No distress ☐ Considerable distress
☐ Slight distress ☐ Extreme distress

EXAMINER USE ONLY:

(CE) _____ (CFH) _____ (OC) _____

APPENDIX B

STUDY ID# _____ HOSPITAL # _____

DO NOT WRITE ABOVE THIS LINE

Brief Pain Inventory (Short Form)

Date: _____/_____ /_____ Time:_____

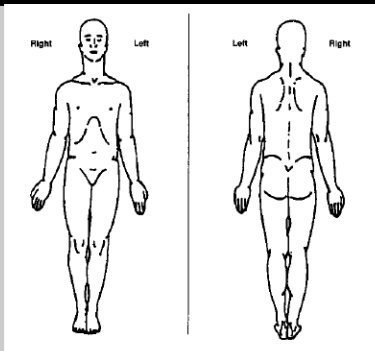
Name: _____ _____ _____

Last First Middle Initial

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these every-day kinds of pain today?

1. Yes 2. No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.



3. Please rate your pain by circling the one number that best describes your pain at its worst in the last 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

4. Please rate your pain by circling the one nuimber that best describes your pain at its least in the last 24 hours.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

5. Please rate your pain by circling the one number that best describes your pain on the average.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

6. Please rate your pain by circling the one number that tells how much pain you have right now.

0	1	2	3	4	5	6	7	8	9	10
No Pain										Pain as bad as you can imagine

7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please circle the one percentage that most shows how much relief you have received.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No Relief										Complete Relief

9. Circle the one number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

B. Mood

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

C. Walking Ability

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

D. Normal Work (includes both work outside the home and housework)

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

E. Relations with other people

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

F. Sleep

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

G. Enjoyment of life

0	1	2	3	4	5	6	7	8	9	10
Does not Interfere										Completely Interferes

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APPENDIX C

PTSD Checklist – Civilian Version (PCL-C)

Patient's Name: _____

Instruction to patient: Below is a list of problems and complaints that veterans sometimes have in response to stressful life experiences. Please read each one carefully, put an "X" in the box to indicate how much you have been bothered by that problem *in the last month*.

No.	Response:	Not at all (1)	A little bit (2)	Moderately (3)	Quite a bit (4)	Extremely (5)
1.	Repeated, disturbing *memories, thoughts,* or *images* of a stressful experience from the past?					
2.	Repeated, disturbing *dreams* of a stressful experience from the past?					
3.	Suddenly *acting* or *feeling* as if a stressful experience *were happening again* (as if you were reliving it)?					
4.	Feeling *very upset* when *something reminded* you of a stressful experience from the past?					
5.	Having *physical reactions* (e.g., heart pounding, trouble breathing, or sweating) when *something reminded* you of a stressful experience from the past?					
6.	Avoid *thinking about* or *talking about* a stressful experience from the past or avoid *having feelings* related to it?					
7.	Avoid *activities* or *situations* because *they remind you* of a stressful experience from the past?					
8.	Trouble *remembering important parts*					

	of a stressful experience from the past?					
9.	Loss of *interest in things that you used to enjoy?*					
10.	Feeling *distant* or *cut off* from other people?					
11.	Feeling *emotionally numb* or being unable to have loving feelings for those close to you?					
12.	Feeling as if your *future* will somehow be *cut short*?					
13.	Trouble *falling* or *staying asleep*?					
14.	Feeling *irritable* or having *angry outbursts*?					
15.	Having *difficulty concentrating*?					
16.	Being *"super alert"* or watchful on guard?					
17.	Feeling *jumpy* or easily startled?					

Weathers, F.W., Huska, J.A., Keane, T.M. *PCL-C for DSM-IV*. Boston: National Center for PTSD – Behavioral Science Division, 1991.

This is a Government document in the public domain.

APPENDIX D

Have you been

diagnosed with

FIBROMYALGIA?

& Have you experienced at least **1**

TRAUMATIC EVENT in your lifetime?

You may qualify for a valuable research study. It will only take about 20-30 minutes of your time. You will receive a **$5 gift card to HEB** if you decide to participate and complete all required forms.

- **Please ask a staff member if you would like to participate.**
- **If you have additional questions, you can contact**

Kristin Sramek
cell: 210-430-1111 / kristinsramek@yahoo.com

APPENDIX E

Consent Form – PTSD as a Mediator of Traumatic Experiences and Fibromyalgia

You are invited to participate in a research study investigating the relationship between fibromyalgia and trauma, which is being conducted by Kristin Sramek, student of the Masters in Health Psychology program at Texas State University – San Marcos under the supervision of Dr. Joseph Etherton, Dr. Kelly Haskard-Zolnierek, and Dr. Theron Stimmel, who are each faculty members of the Psychology Department at Texas State University – San Marcos. Contact information for all participating parties is listed at the bottom of this form. We hope to learn more about the frequent coexistence of trauma and fibromyalgia. You were selected as a possible participant in this study because you reported that you are experiencing fibromyalgia or another chronic pain syndrome, and you have self-reported experiencing a traumatic life event. If you decide to participate, you will complete several questionnaires about your pain and traumatic experiences. It should take you approximately 20 to 30 minutes to complete the necessary forms depending on how quickly you read and respond. You will receive a gift card to HEB in the amount of $5 if you complete all the required forms. It is important to note that by participating, you will be offering your personal information for examination and comparison in order to improve the understanding of the relationship between chronic pain and traumatic life experiences.

You may experience some discomfort in recalling traumatic experiences and/or answering questions about your pain. (Sample question: Were you involved in a motor vehicle accident for which you received medical attention or that badly injured or killed someone? ("never" to "more than 5 times"). You are free to not answer any given question if you so choose. A list of healthcare professionals is listed at the end of this form, should you require mental health attention as a result of participation.

This consent form will be the only document that will identify you in relation to this study. Your answers to the questionnaires will be coded with a number that will not be identified with your name. All study materials will be kept under lock and key in a filing cabinet. Hard copies will be destroyed after the data is stored electronically. If you decide to participate, you are free to discontinue participation at any time without consequence. If you have any questions, please do not hesitate to contact us. If you have any additional questions later, please contact Kristin Sramek at *210-430-1111* who will be happy to answer them. Pertinent questions about the research, research participants' rights, and/or research-related injuries to participants should be directed to the IRB chair, Dr. Jon Lasser (512-245-3413 – lasser@txstate.edu), or to Ms. Becky Northcut, Compliance Specialist (512-245-2102). You will be offered a copy of this form to keep. Findings will be provided to participants upon completion of the study if requested.

You are making a decision whether or not to participate. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at anytime without penalty after signing this form should you choose to discontinue participation in this study.

_____ _____

Signature of Participant Date

_____

Signature of Investigator

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210-447-6363

Center for Health Care Services
711 E Josephine St
San Antonio, TX 78208
210-225-4475

Alamo Mental Health Group
4242 Medical Dr, Ste. 6300
San Antonio, TX 78229
210-614-8400

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